

REMARKS

By the present amendment, the specification has been amended to place "brief explanation of the drawings" between brief summary of the invention and detailed description of the invention. Claim 7 has been canceled without prejudice or disclaimer of the subject matter thereof. Independent claims 1, 13 and 14 have been amended to incorporate the features of the canceled claim 7, noting that applicants advised that canceled claim 7 corresponds to the claim allowed by the Japanese Patent Office. Claims 3-6 have been amended to depend only on claim 1.

Furthermore, applicants disagree with the Examiner's rejection of claims 2-6, 9-11 and 17 under 35 U.S.C. §112, 2d paragraph, as being indefinite, since all the limitation recited in the rejected claims 2-6, 9-11 and 17 are included in the amended claim 1. Thus, the claim rejections under 35 U.S.C. §112, 2d paragraph, should be withdrawn.

As to rejection of claims 1-11 and 13-19 under 35 U.S.C. §103(a) as being unpatentable over Kawasaki et al., U.S. Patent No. 7,463,916 in view of Stetson, U.S. Patent No. 6,701,170, the rejection of claim 12 under 35 U.S.C. §103(a) as being unpatentable over Kawasaki et al., U.S. Patent No. 7,463,916 in view of Stetson, U.S. Patent No. 6,701,170, as applied to claim 1-11 above, and further in view of Keen et al., U.S. Patent No. 6,264,591, the rejection of claim 17 under 35 U.S.C. §103(a) as being unpatentable over Kawasaki et al., U.S. Patent No. 7,463,916 in view of Stetson, U.S. Patent No. 6,701,170, as applied to claim 14-19 above, and further in view of Ito et al., U.S. Patent No. 7,025,728, such rejection is traversed insofar as it is applicable to the present claims, and reconsideration and withdrawal of the rejections are respectfully requested.

More particularly, claim 1 has been amended to recite in relevant part: "...a signal selecting means for selecting specified component signals based on correlation values between component signals and a pre-determined reference signal..." (emphasis added). Independent claims 13 and 14 have been amended to recite similar features and these features are described, by way of example only, in paragraphs [0025]-[0028] and [0051]-[0053] of the specification and illustrated in FIGS. 1-5.

As illustrates in FIG. 1, the signal processing unit 30 separates noise from the hemoglobin change signals and reconstruct (restore) the hemoglobin change signals by using noise-removed components. As illustrated in FIG. 4, the noise separation comprises mainly a processing 401, which separates the hemoglobin amount change signals into components and display them, a processing 402, which removes specified components of displayed components as noise components or select specified components for the use in the reconstruction, and a processing 403, which reconstructs the hemoglobin amount change signals by using the noise-removed components or the components selected for the use in the reconstruction. The optical measurement apparatus for living body displays the hemoglobin amount change signals as the time course waveforms as shown in FIG. 3, analyzes these waveforms, as required, identifies the sites most reactive to the task loaded and assesses cerebral diseases and others based on the characteristics of the response waveforms of the subject (processing 406).

In the present invention, a step 401, which separates the hemoglobin amount change signals into components, adopts a principal component analysis or independent component analysis, and conduct the separation by selecting either of

them or combining them.

The principal component analysis is a method to extract statistically uncorrelated signals by maximizing the variance without taking into account the components composing the measured hemoglobin amount change signals and the transfer function used to produce the measurement results. The independent component analysis, on the other hand, is a method to extract signals regarded as independent in terms of probability density by finding a transfer function in the assumption that the hemoglobin amount change signals are resulted from the linear combination of change signals from various cerebral sites and external signals in a correlated manner. The selection of either of these two analyses, or the combination of these two according to the characteristics of the noise ensures highly precise analysis. For example, when several signal sources are typical stereotyped noise, the independent component analysis is effective.

These principal component and independent component analyses are the component analysis technique whose algorithm has been established in the multi-variance analysis, and in the optical measurement apparatus of this embodiment a software for implementing the algorithm is built in at the signal processing unit 30 to perform said analysis by selecting either of the two or combining the two, as appropriate, through a user interface (GUI) at the input/output unit 33.

According to the present invention, the noise separation procedure by the component analysis of measured signals including hemoglobin amount change signals measured in the optical measurement can effectively remove noises regardless of the characteristics of the noise and obtain high-precision target signals.

Applicants submit that the aforementioned features of the independent and

the dependent claims are not disclosed or taught in the cited art, as will become clear from the following discussion.

Kawasaki (US 7,363,916 B2) discloses an optical measurement apparatus, which finds temporal-change distribution of signals based on the positional relation of two measurement points of signals. In the portion (column 8, lines 45-53) on which the examiner relies for regarding claim 7 of the invention as obvious, the followings are taught: "if a representation of the correlation between the living-body transillumination intensity signals at each measuring position is commanded from the console, the processing means 19 calculates a correlation value from the living-body transillumination signals at each measuring position and the predetermined standard values stored in the storing means 28, and it displays a numerical value or a graph of the thus obtained correlation value. This allows an examiner to objectively determine the location of every kind of function area, which has been conventionally determined by the examiner's subjective reading of the display." Here, Kawasaki only teaches that the processing means calculates a correlation between each signal and a standard value and displays the correlation. It does not teach signal selecting means which selects specified component signals among the multiple component signals based on correlation with a pre-determined reference signal, as recited in the independent claims of the application.

Stetson (US 6,701,170 B2) discloses only that noise is eliminated by combining a principal component analysis and independent component analysis in the field of pulse oximetry. On the other hand, the apparatus of the invention comprises a signal separating means, which separates hemoglobin-change signals into multiple component signals, a signal selecting means, which selects specified

component signals based on correlation between the multiple component signals and a reference signal showing a feature of living-body reaction of the examined object, and a signal reconstruction means, which reconstructs a hemoglobin-change signal by using the selected component signals, as recited in the amended claim 1. This configuration of the invention enables to attain technical objects of obtaining local brain blood-amount-change signals free from noise components, which cannot be eliminated by conventional processing such as filtering or moving averaging.

The above-mentioned configuration of the invention cannot be made even by combining Kawasaki with Stetson, and the technical objects of the invention cannot be attained by the combination of Kawasaki and Stetson. Thus, both Kawasaki and Stetson fail to disclose or teach: "...a signal selecting means for selecting specified component signals based on correlation values between component signals and a pre-determined reference signal..." (emphasis added), as recited in the independent claims of the application. Accordingly, applicants submit that the independent and the dependent claims patentably distinguish over Kawasaki or Stetson, taken alone, or in any combination thereover and should be considered allowable over the combination of the cited art.

Since claims 12, 17 depend on the amended claim 1, claim 14 respectively, they are also patentable over the combination of Kawasaki, Stetson and Keen et al. or Ito et al.

In view of the above amendments and remarks, applicants submit that all claims present in this application should now be in condition for allowance and issuance of an action of a favorable nature is courteously solicited.

If the Examiner believes that there are any other points which may be clarified or otherwise disposed of either by telephone discussion or by personal interview, the

Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Antonelli, Terry, Stout & Kraus, LLP Deposit Account No. 01-2135 (Docket No. 1070.46175X00), and please credit any excess fees to such deposit account.

Respectfully submitted,
ANTONELLI, TERRY, STOUT & KRAUS, LLP

By /Inna S. Shestul/ I.S.
Inna S. Shestul
Registration No. 55,616

ISS/kej
1300 North Seventeenth Street, Suite 1800
Arlington, Virginia 22209
Telephone: (703) 312-6600
Facsimile: (703) 312-6666